

DC Power Rack

DCR PSR327-8.1 LV/HV

USER MANUAL



UM_DCR_PSR327_8.1_E_R3.0



Notes to this manual

ATTENTION! Read this manual very carefully before installing and commissioning the DC power rack. This manual is a part of the delivered DC power rack. Familiarity with the contents of this manual is required for installing and operating the DC power rack. The rules for prevention of accidents for the specific country and the general safety rules in accordance with IEC 364 must be observed.

The function description in this manual corresponds to the date of publishing. Technical changes and changes in form and content can be made at any time by the manufacturer without notice. There are no obligations to update the manual continually.

The unit is manufactured in accordance with applicable DIN and VDE standards such as VDE 0106 (part 100) and VDE 0100 (part 410). The CE marking on the unit confirms compliance with EU standards 2006-95-EG (low voltage) and 2004-108-EG (electromagnetic compatibility) if the installation and operation instructions are followed.

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Changes and errors excepted.

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DC Power Rack

DCR PSR327-8.1 LV/HV

User Manual

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Revision	Description of change	Writer	Date
00	Preliminary version	RTH	2008-02-01
01	First edition	RTH	2008-02-15
02	Minor addition in the section "rear side connection"	RTH	2008-02-28
03	"Recommended wire cross section" for the output inserted	RTH	2008-03-04
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1.0	Designation of the alarm relay outputs corrected, new revision status numbering (X.X) introduced.	RTH	2008-12-18
2.0	Section "Extensions" added.	RTH	2009-06-05
2.1	Minor text modifications included.	RTH	2009-12-17
3.0	Section 3.2.7 "Protection against electric shock at the DC output connectors" inserted.	RTH	2010-05-11

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1A. Safety Instructions



Warning!

Because several components of operating electric devices are charged by dangerous voltage, the improper handling of electric devices may be the cause of accidents involving electrocution, injury, or material damages.

- Operation and maintenance of electrical devices must be performed by qualified skilled personnel such as electricians in accordance with EN 50110-1 or IEC 60950.
- Install the unit only in areas with limited access to unskilled personnel.
- Before starting work, the unit must be disconnected from mains. Make sure that the unit is earthed.
- Only spare parts approved by the manufacturer must be used.

1B. Electric Waste Disposal

Separate collection is the precondition to ensure specific treatment and recycling of waste electrical and electronic equipment and is necessary to achieve the chosen level of protection of human health and the environment.

In the case of waste disposal of your discarded equipment we recommend to contact a waste management company.

2. General information

The DC power rack is a connection unit ready for integration in system cabinets with standard 19" frame. A high voltage (HV) and low voltage (LV) version is available. The unit can be equipped with a maximum of three rectifiers of type PSR327 (PSR312) and one DC controller UPC3 and delivers an output power up to 8100W. After safe mechanical and electrical connecting, the unit is ready for operation.

The DC controller UPC3 is easy to configure by software and adapts the system to customer's applications and battery parameters.

Extensions:

If more output power is required, the power supply system can be extended with racks of type DCR PSR327-10.8. This rack is designed to be fitted with four rectifiers PSR327 (PSR312). For more information about extensions see section 6. "[Extensions](#)".

2.1 Block diagram

DCR PSR327-8.1 LV/HV

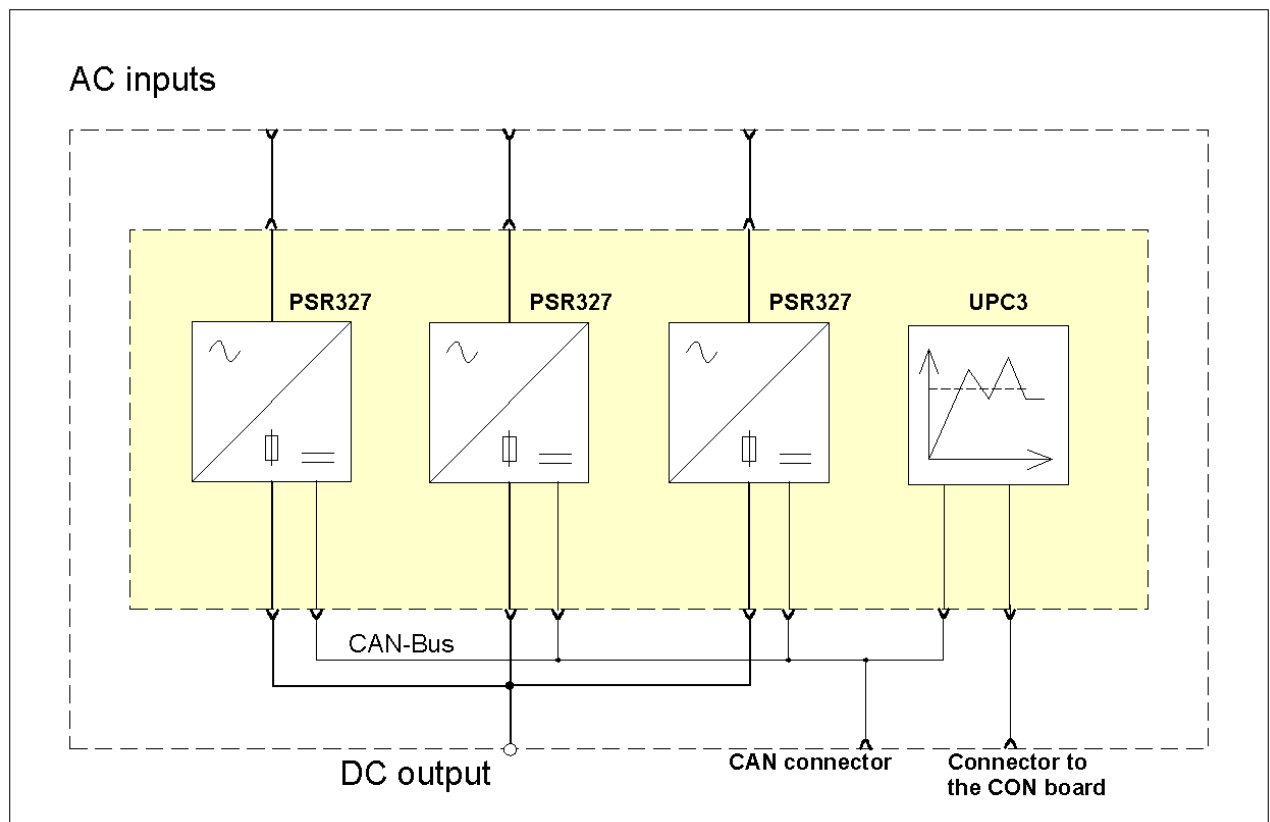


Figure 1) - Block diagram

2.2 Possible rack configurations

One up to three rectifiers PSR327 (PSR312) with output voltages according to the table below, plus one obligatory DC controller UPC3 can be integrated into one rack. Make sure to use the correct UPC3 unit in accordance with the output voltage of the used rectifiers (see the following table).

Designation of the rack	Article code of the rack		For rectifier/ output voltage	Necessary type of DC controller UPC3//Article code
DCR PSR327-8.1 LV	102-327-318.LV01	Input voltage = 230V _{AC}	PSR312/24V _{DC}	UPC3-24V//301-003-498.02
			PSR327/48V _{DC}	UPC3-48/60V//301-003- 598.02
			PSR327/60V _{DC}	
DCR PSR327-8.1 HV	102-327-318.HV01		PSR327/110V _{DC}	UPC3-110V//301-003-798.02
			PSR327/220V _{DC}	UPC3-220V//301-003-898.02

Output power of the rack, equipped with PSR312:

Number of installed Rectifiers (PSR312)	Output power (without redundancy)	Output power (n + 1)	Output power (n + 2)
1	1200W	---	---
2	2400W	1200W	---
3	3600W	2400W	1200W

Output power of the rack, equipped with PSR327:

Number of installed Rectifiers (PSR327)	Output power (without redundancy)	Output power (n + 1)	Output power (n + 2)
1	2700W	---	---
2	5400W	2700W	---
3	8100W	5400W	2700W

2.3 Perspective view

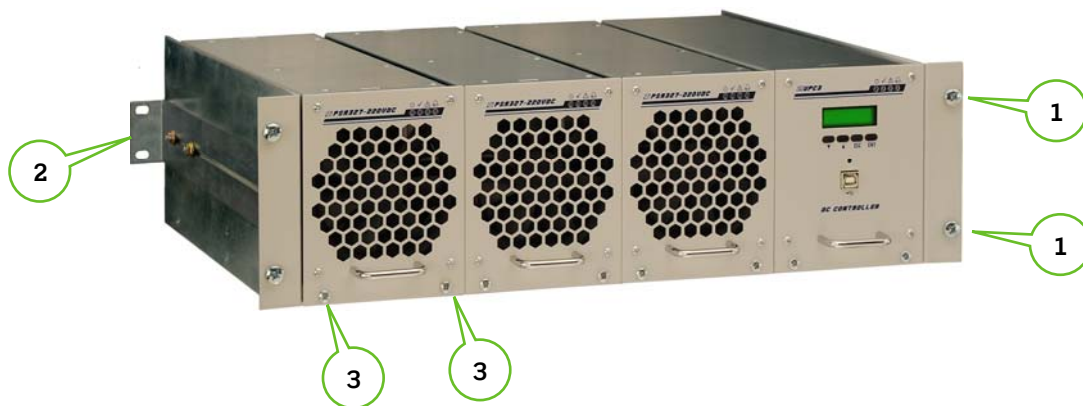




Figure 2) - DC power rack fully equipped with three rectifiers PSR327 and one DC controller UPC3.

Fastening elements according to figure 2)		Comment
1	Four screws M6 to fix the sub rack to the frame of the system cabinet	Component parts of the sub rack
2	Two adjustable assembly brackets (on the left and right side) to fix the sub rack to the rear frame of the system cabinet.	
3	Two captive screws are used for each module to secure it to the sub rack	Component parts of the modules

2.4 Available options and required equipment

Description	Article code	
 DCC-CB1; connection board (with MSTB screw terminals), required to connect all measuring, control and signalling wires over the backplane of the subrack to the DC controller UPC3, see section 3.2.9 " Connection Board "	302-DCC-CB1.00 (Included in delivery of the sub rack)	
Cover plate (with handle) to cover empty slots, 1/4 x 19", 3U, colour RAL 7035	881-MEC-BPL.03.21.B	
Temperature sensor KTY81-220 T092 with cable of 4m length	302-TMP-KTY.04	
CAN-Bus connection cable, length 0.5m (other lengths available)	880-KAB-CAN.05	
 Extension rack DCR PSR327-10.8 for four rectifiers PSR327 (312), see section 6. " Extensions ".	For 24-60V _{DC} : 102-327-408.LV01 For 110-220V _{DC} : 102-327-408.HV01	

2.5 Cooling and air flow direction

The PSR327 (312) units are cooled with internal fans. The airflow is from the front to rear side. The fans are monitored and speed-controlled dependent on module temperature. To provide sufficient air flow, a minimum space (see figure 3, item "A") of 50 mm is required between the backplane of the rack and the rear cabinet wall as well as an unobstructed supply of air to the front of the modules.

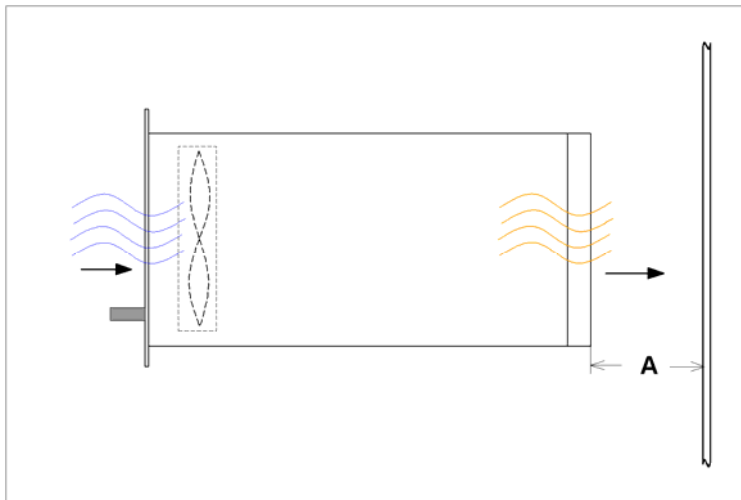


Figure 3) - Rack air flow

3. Handling

3.1 Storage

Power racks must be stored in a dry, dust free environment with a storage temperature in accordance with the specific technical data (see [section 5](#)).

3.2 Commissioning

1. Carefully unpack the unit and mount it on your power supply cabinet with 4 screws M6 (**1**) at the front side.
2. Adjust the assembling brackets (**2**) on the left and right side of the rack with the relevant nuts of the rear cabinet frame and tighten the brackets with 4 screws M6 (**3**) as shown in figure 4).



Figure 4) - Rack mounting points

REMARK: Before assembling the modules, the following settings have to be checked and if necessary must be done on the empty rack:

1. CAN-Bus termination
2. CAN address designation

For details, see the following sections.

Figure 5) - Front view of the empty rack

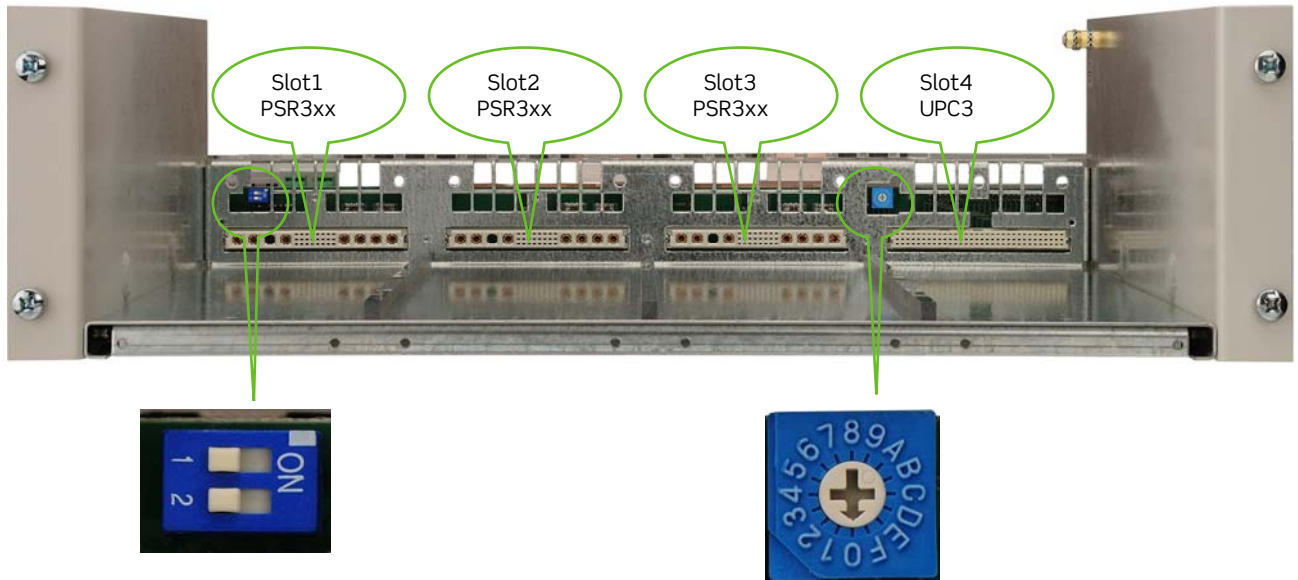


Figure 6) - CAN-Bus termination switches (For details see the section 3.2.2 "CAN-Bus Termination")

Figure 7) - Rotary switch= CAN address selector (For details see the section 3.2.3 "[CAN Address Designation](#)")

3.2.1 Communication interface

The DCR PSR327 is equipped with a serial data interface in accordance with the Controller Area Network (CAN) specification.

Several power racks and/or modules in a system can be controlled and monitored through the CAN-Bus by a central DC controller unit UPC3.

Two CAN-Bus connectors (X6= CAN1; X7= CAN 2) are located on the rear of the sub rack (see figure 9).

3.2.2 Can-Bus termination

The CAN-Bus must be terminated at both ends. If no other power rack and/or module is connected (CAN 2 not used), the CAN termination resistor must be enabled by setting the CAN termination switch 1, 2 or both (shown in figure 6) to "ON" position.

If CAN 2 is connected too, the CAN termination resistor must be disabled by setting the CAN termination switches 1 **and** 2 to "OFF" position. For switch functions in detail, see the table below.

Table "CAN-Bus termination switch functions"

Switch 1 position	Switch 2 position	CAN-Bus termination resistor:
ON	OFF	Enabled
OFF	ON	Enabled
ON	ON	Enabled
OFF	OFF	Disabled

ATTENTION: Missing terminations or too many terminations within the system can disturb the CAN-Bus communication. No more than two termination resistors should be activated on one bus and these should be located at both ends of the bus.

3.2.3 CAN address designation

All racks (modules) within a system must be addressed for a clear identification through the control unit.

The specific address for each rack must be designated with the CAN address selector (rotary switch) shown in figure 7).

Rotary switch position	Rack address
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	11
B	12
C	13
D	14
E	15
F	16

If only one rack is used within the power supply system, the rack must be addressed with the rack address 1 (rotary switch position “0” according to the table above).

A second used rack must be addressed with the rack address 2 (rotary switch position “1” according to the table above), etc.

The CAN addresses of the installed modules are automatically designated by the rack.

3.2.4 Fitting of the modules

After you have completed the settings, fit the modules into the slots of the sub rack.

Fill the rack beginning with the left slot. The slots 1 to 3 are provided for the rectifiers, slot 4 is provided for the controller unit UPC3 (see figure 5).

Empty PSR slots must be covered with cover plates (see section 2.4 “[Available Options and required Equipment](#)”).

3.2.5 Rear view/electric connectors

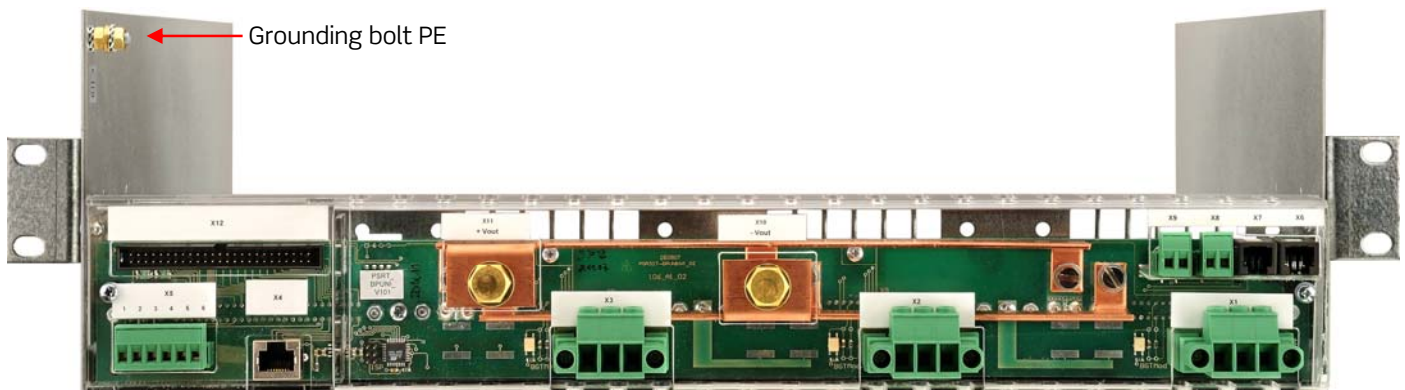


Figure 8) - Rear view

REMARK: Figure 8) shows the rack equipped with a clear-transparent plastic guard for better clearness. This is not standard! Serially the rack is equipped with a non-transparent plastic guard. The connectors (terminal blocks) are labelled (X1 ... X12) for a clear identification.

To clarify: The drawing (see figure 9) shows the labelling of the terminal blocks.

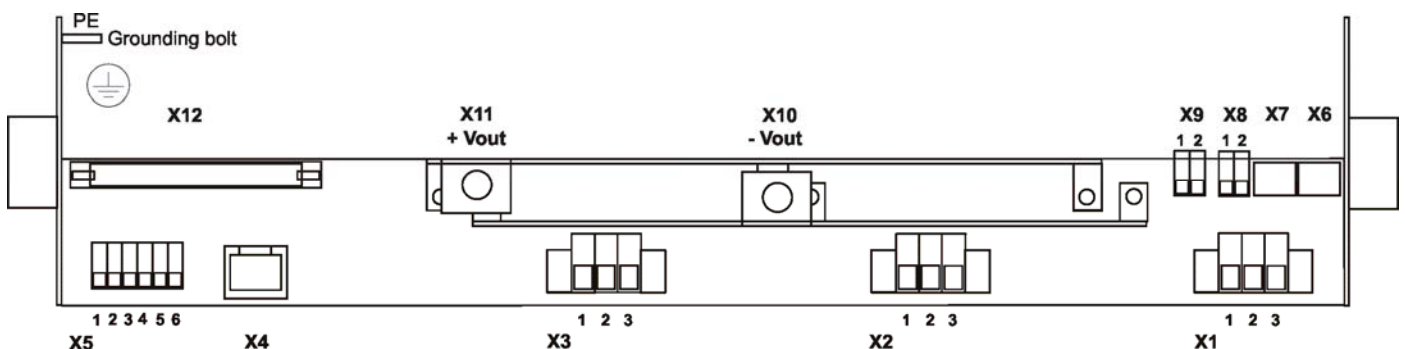




Figure 9) - Rear electrical connectors

Connect the input and output wires as well as the alarm wires to the rear connectors in accordance with the connection table below.

For the connection of the measuring, control and signalling lines of the system, an external connection board is necessary (see the section 3.2.8 "Connection Board"). For the connection of the connection board to the power rack (X12), a 50-pole ribbon cable is used.

Please note:

-  The special grounding bolt (PE) of the rack itself must be grounded with the cabinet frame (common PE of the system).
-  The PE connectors of the AC inputs (X1.1, X2.1 and X3.1) also must be grounded with the cabinet frame (common PE of the system).

REMARK: The high voltage (HV) rack looks similar to the low voltage (LV) rack. The difference is, that the connector **X9** (sensor input for voltage drop compensation) is not connected for the HV rack!

3.2.6 Connection table

Assignment of the rear side connectors according to figure 9).

Connector	Function	Recommended wire cross section
X1	AC input 1	
1	PE	2.5 mm ²
2	N	2.5 mm ²
3	L1	2.5 mm ²
X2	AC input 2	
1	PE	2.5 mm ²
2	N	2.5 mm ²
3	L2	2.5 mm ²
X3	AC input 3	
1	PE	2.5 mm ²
2	N	2.5 mm ²
3	L3	2.5 mm ²
X4	Ethernet connector (RJ45)	Cord set
X5	Measurement input	
1	+V1 (battery voltage*)	0.75mm ²
2	-V1	0.75mm ²
3	+V2 (system voltage*)	0.75mm ²
4	-V2	0.75mm ²
5	+V3 (tap voltage)	0.75mm ²
6	-V3	0.75mm ²
* It is necessary to connect the battery voltage alternatively the system voltage, because the battery voltage alternatively the system voltage is to be used for the power supply of the DC controller unit UPC3.		
X6	CAN 1 (RJ11, 6-pole)	Cord set
X7	CAN 2 (RJ11, 6-pole)	Cord set
X8	Rectifier fault	
1	Relay output (COM, NC)#	0.75mm ²
2	Relay output (COM, NC)#	0.75mm ²
# NC is closed at failure.		
X9**	Sensor input for voltage drop compensation	
1	+ sense	0.75mm ²
2	- sense	0.75mm ²
**Not connected for the HV-rack!		

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Connector	Function	Recommended wire cross section, calculated for a fully equipped rack (3 rectifiers) @ output voltage				
		24V _{DC}	48V _{DC}	60V _{DC}	110V _{DC}	220V _{DC}
X10#	DC output (minus pole), connection with M8 bolt (brass)	70mm ²	95mm ²	70mm ²	25mm ²	10mm ²
X11#	DC output (plus pole), connection with M8 bolt (brass)	70mm ²	95mm ²	70mm ²	25mm ²	10mm ²
#ATTENTION: Please see section 3.2.7 for fitting the protection against electric shock of the DC output connectors.						
X12	Terminal block for connection to the external connection board	Cord set (ribbon cable, 50-pole)				

3.2.7 Protection against electric shock at the DC output connectors

In the scope of delivery of the rack there are plastic covers available which are to be used for **protection against electric shock** at the DC output connectors. They must be fitted according to the figures 10) and 11a) when the DC output cables are fitted.

X11 = DC output
"Plus"

X10 = DC output
"Minus"

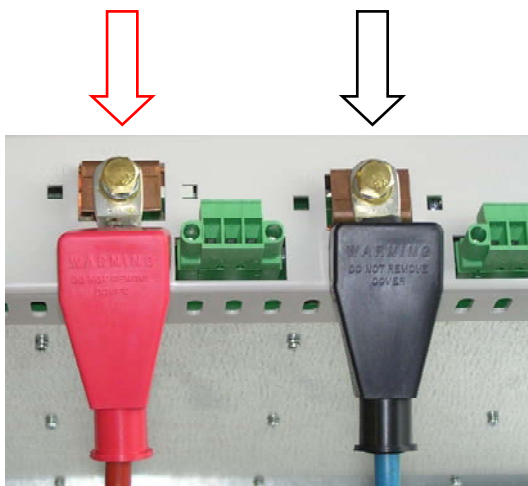


Figure 10) - Fitting of the covers

Put the covers (red for "Plus"; black for "Minus") over the terminal end of the DC output cable according to figure 10). Tighten each terminal end using one M8 bolt with brass washer and spring washer at the DC outputs "Plus" and "Minus".

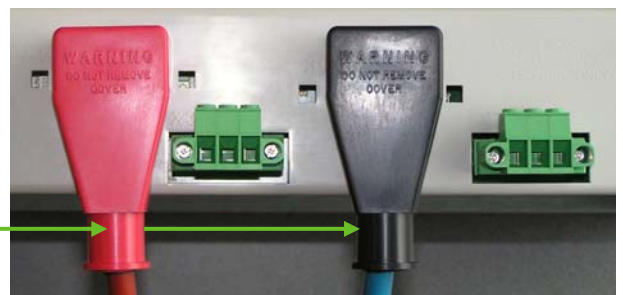


Figure 11a) - Final fitting position of the covers

Finally put the covers over the outputs according to figure 11a).



Figure 11b) - Fixing the cover by cable strap

REMARK: According to figure 11b) we recommend to fix the covers using cable straps in order to avoid getting out of place of the covers.

3.2.8 Schematic diagram (example of use)

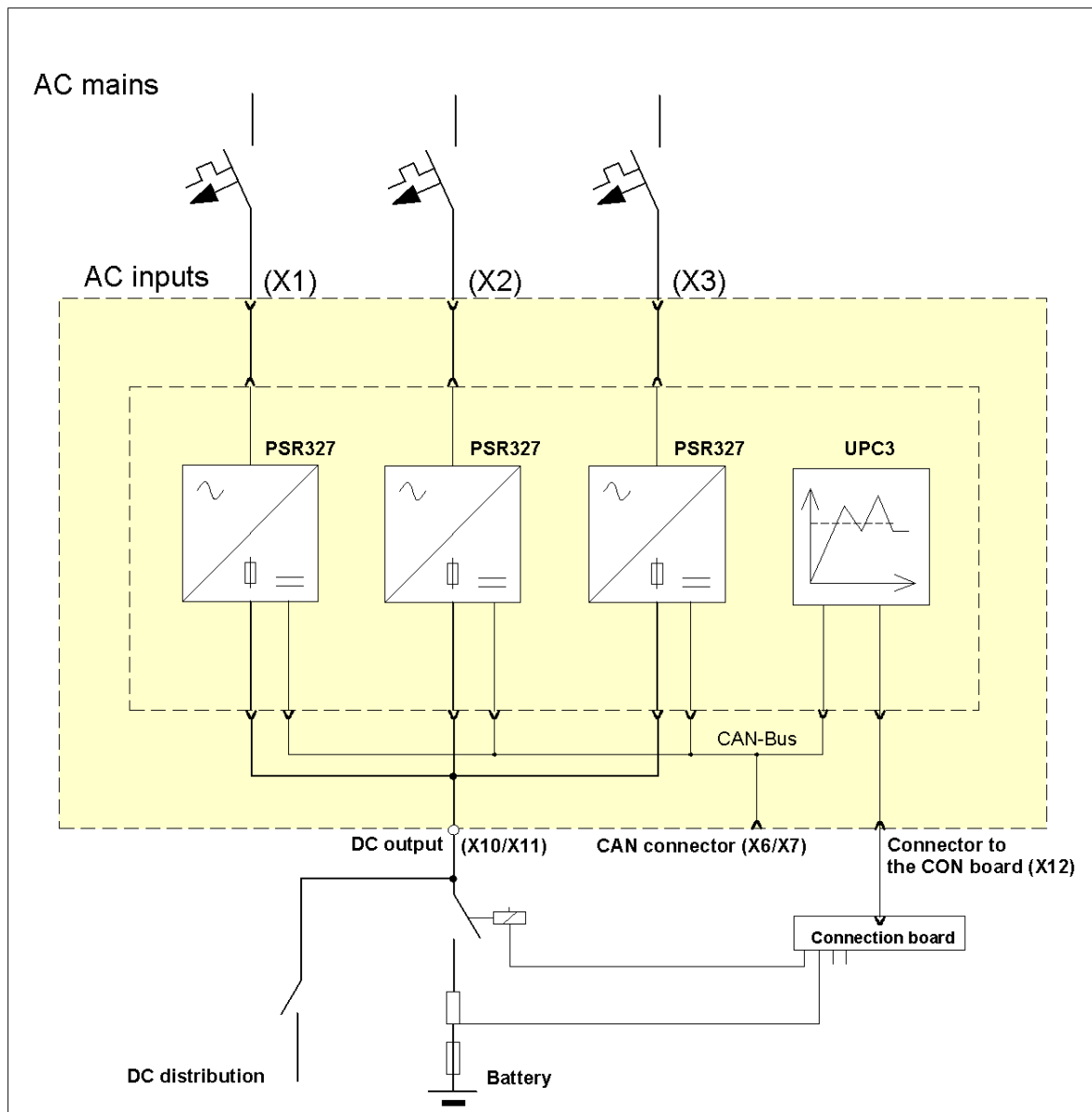


Figure 12) - Schematic diagram



An external separate fuse per each input is recommended!

With this fuse each module individually can be switched ON/OFF and therefore unused slots are isolated (higher safety level).

Recommended input fuses: 16A MCB, characteristic "B"

3.2.9 Connection board

As noted above and indicated in the schematic diagram (see [figure 12](#)), it is necessary to use an external extension board (included in delivery of the DC power rack), to connect all measuring, control and signalling lines of the system over the relevant connector (X12) of the DC power rack to the DC controller unit UPC3.

All measuring, control and signalling lines can be directly connected to the connection board. For the connection of the connection board to the DC power rack, a 50-pole ribbon cable (included in delivery of the connection board) is used.

For the sake of completeness following a brief description of the connection board:

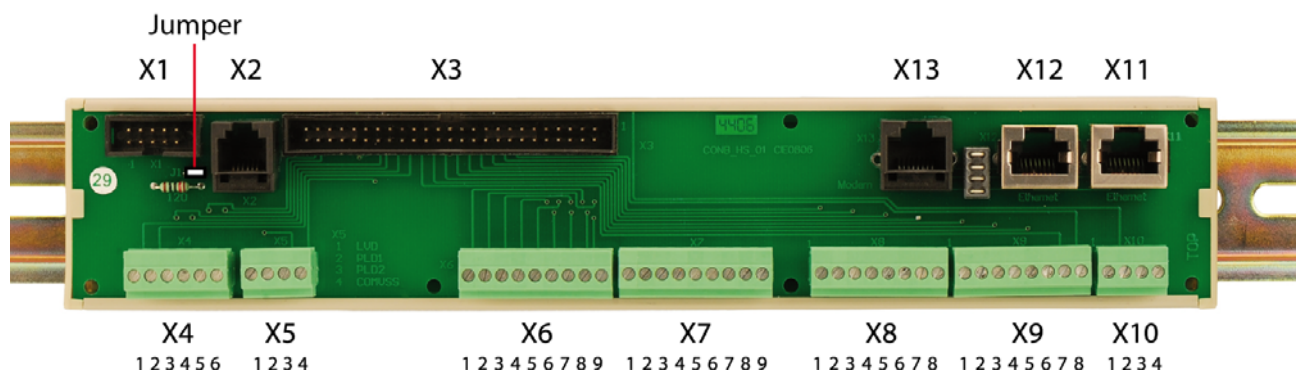


Figure 13) - Top view of the connection board

Overview of the possible connections according to figure 13).

Connector	Function
X1	Commonly not used
X2	RJ11, 6-pole CAN connector*
X3	Terminal block for ribbon cable (50-pole)
X4	Three current measuring inputs I1-I3, for shunts 60mV
1	+I1
2	-I1
3	+I2
4	-I2
5	+I3
6	-I3
X5	Control outputs for contactors LVD, PLD 1 + 2, optocoupler; max. 60V/20mA
1	LVD (OC)
2	PLD1 (OC)
3	PLD2 (OC)
4	COMVSS

*If X2 is connected, the jumper must be removed.

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Connector	Function
X6	Three potential free relay outputs, contact load: max. 60V/max. 500mA
1	Relay K1, NO
2	Relay K1, COM
3	Relay K1, NC
4	Relay K2, NO
5	Relay K2, COM
6	Relay K2, NC
7	Relay K3, NO
8	Relay K3, COM
9	Relay K3, NC
X7	Three potential free relay outputs, contact load: max. 60V/max. 500mA
1	Relay K4, NO
2	Relay K4, COM
3	Relay K4, NC
4	Relay K5, NO
5	Relay K5, COM
6	Relay K5, NC
7	Relay K6, NO
8	Relay K6, COM
9	Relay K6, NC
X8	Four digital inputs Din1-Din4
1	Digital input 1
2	DGND
3	Digital input 2
4	DGND
5	Digital input 3
6	DGND
7	Digital input 4
8	DGND
X9	Four digital inputs Din5-Din8
1	Digital input 5
2	DGND
3	Digital input 6
4	DGND
5	Digital input 7
6	DGND
7	Digital input 8
8	DGND
X10	Two temperature measuring inputs for sensors of type KTY81
1	+Temp. sensor 1
2	GND
3	+Temp. sensor 2
4	GND
X11 + X12	RJ45 Ethernet connectors
X13	RJ45 ISDN connector

4. Maintenance

In general, the system is maintenance-free.

A yearly inspection with following checks is recommended checking the following:

- Correct fan operation (rectifiers)
- Mechanical inspection
- Removal of dust and dirt
- Check for internal dust or humidity

ATTENTION! Dust combined with moisture or water may influence or destroy the internal electronic circuits.

Dust inside the unit can be blown out with dry compressed air.

The interval between the checks depends on ambient conditions of the installed system.

For the exchange of defective fans in the rectifier modules, an additional instruction manual is available on request.

5. Technical Specifications

Type designation	DCR PSR327-8.1 LV			DCR PSR327-8.1 HV	
Article code	102-327-318.LV01			102-327-318.HV01	
Main Data:					
Modules	Designed for the use of 1 up to max. 3 rectifiers of series PSR312 (Vo= 24V _{DC}) or PSR327 (Vo= 48; 60V _{DC}) and 1 DC controller UPC3 (24; 48/60V version)			Designed for the use of 1 up to max. 3 rectifiers of series PSR327 (Vo= 110; 220V _{DC}) and 1 DC controller UPC3 (110; 220V version)	
Input voltage	230V _{AC}			←	
Internal input fuses	There are no internal fuses, we recommend an individual fuse for each input				
Nominal output voltage	24, 48, 60V _{DC} (single-output), depends on the used rectifiers			108, 216V _{DC} (single-output), depends on the used rectifiers	
Max. output current (rack fully equipped with 3 rectifiers)	150A _{DC} @24V _{DC}	168A _{DC} @48V _{DC}	135A _{DC} @60V _{DC}	75A _{DC} @108V _{DC}	37.5A _{DC} @216V _{DC}
Output power	PSR312: 1200 up to 3600W; PSR327: 2700 up to 8100W			2700 up to 8100W	
Electrical connectors:					
AC input	3 x input (1 per each module)			←	
DC output	1 x output (copper busbar)			←	
Signalling contacts	Rectifier fault: 1 x potential free relay output COM, NC; max. switching capacity: 60V _{DC} , 500mA				
Communication interfaces	2 x isolated CAN-Bus connectors (RJ11, 6-pole), 1 x Ethernet (RJ45)				
Measurement inputs	3 x (V1, V2, V3); for example: battery voltage, system voltage, tap voltage of the battery				
Sensor input	1 x for voltage drop compensation			not connected	
External connection	1x 50-pole terminal block for the connection of all measuring, control and signalling lines of the system via the connection board to the control unit UPC3				

Environmental:

Max. installation altitude	≤1500 m	←
Ambient temperature	operation: -20°C...+55°C; storage: -40°C...+85°C	
Audible noise (modules)	≤ 45dB(A) at 1m distance	←

Mechanical:

Type of construction	Sub rack, 19", 3U	←
Cooling	The rectifiers are fan-cooled (front-to-rear airflow), temperature-regulated and monitored	
Surfaces	powder coating RAL 7035 (front only), constructive parts: anodized metal	
W/H/D	483/133/345mm, 388mm with rear connectors; (19", 3U)	
Minimum installation depth	438 mm plus 25.5mm length of the module handle	
Weight	approx. 4.9 kg (excluding PSR and UPC3 modules)	

Applicable standards:

Mechanical construction	acc. to VDE 0160 edition 5.88 chapter 7.2.2	
Protection class	IP20	←
Climatic conditions	acc. to IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2	
RFI suppression / immunity	CE-label, (EN50081-1, EN55011/55022 class „B“, EN50082-2, EN61000-4 part 2/3/4/5)	
Compliance to safety standards	acc. to EN60950-1, VDE0100 T410, VDE0110, EN60146	

5.1 Dimensional Drawings:

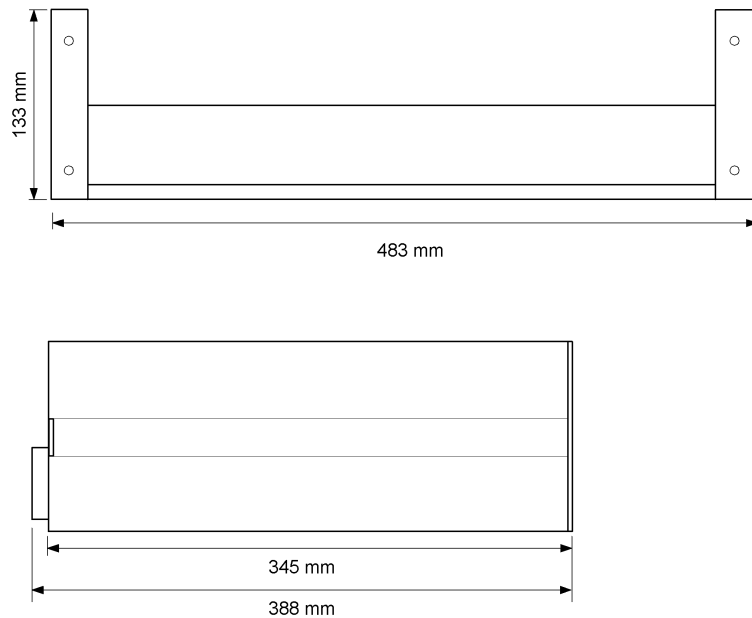


Figure 14) - Rack dimensions

6. Extensions

To extend the system output power, up to a maximum of 11 racks of type DCR PSR327-10.8 can be connected in parallel to the basis rack DCR PSR327-8.1 (see figure 15).



Rack 1) Basis rack DCR PSR327-8.1 (three rectifiers PSR327 plus DC controller UPC3).



Rack 2) Extension rack DCR PSR327-10.8 (for max. four rectifiers PSR327).

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•
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Rack 12) A total of 12 racks can be paralleled. Consequentially a maximum system output power of $47 \times 2.7\text{kW} = \mathbf{126.9\text{kW}}$ can be achieved.

If the racks are fitted with PSR312 (output= 24V_{DC}) the maximum system output power is $47 \times 1.2\text{kW} = \mathbf{56.4\text{kW}}$.

Figure 15) - System extension

For more information about the rack DCR PSR327-10.8 please read the specific user manual.

6.1 Schematic diagram DCR PSR327-8.1 and -10.8 connected in parallel

Figure 16) shows a simple example how to connect the racks DCR PSR327-10.8 and DCR PSR327-8.1 in parallel.

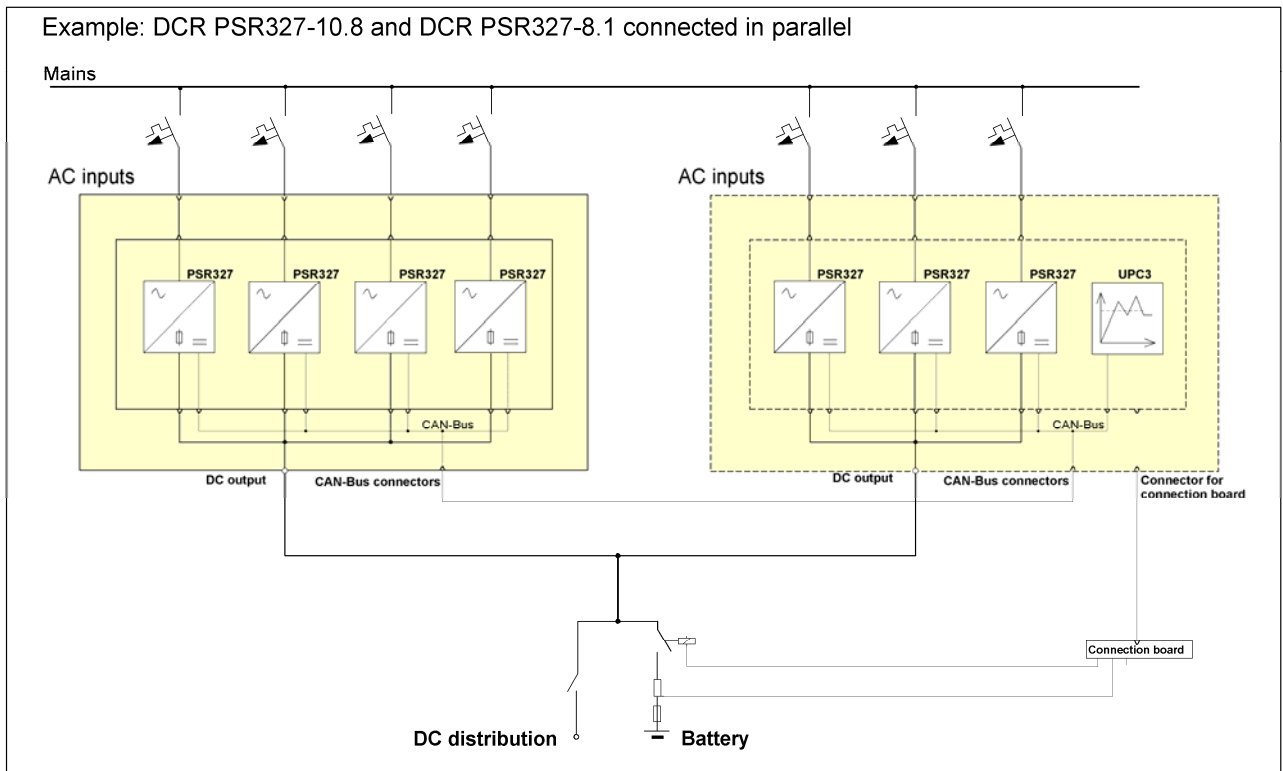


Figure 16) - DCR PSR327-10.8 and DCR PSR327-8.1 connected in parallel

[illegible]



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